# EXECUTIVE SUMMARY

## 1. BACKGROUND

The roads of the north -eastern States are pathetic condition due to the soil type and majorly due its climatic conditions.India's north eastern region, where the road ministry has made ambitious plans to improve road infrastructure, including an accelerated road development program DoNER with NHIDCL has undertaken measures to improve the transport system in North Eastern States and out of them, Wokha – Merapani–Golaghat road is also considered for up gradation. This road has an approximate length of 22 km starting from Wokha Junction (26/000) to (48/000) in the State of Nagaland.

The task of widening and strengthening of the road was entrusted to NHIDCL, New Delhi for which M/s SM Consultants have been engaged by NHIDCL for preparation of detailed project report for rehabilitation and up-gradation of the existing intermediate lane road to two lane configuration.

**1.1** The Inception report for this road was submitted in the month of July 2016. A presentation was made to the NHIDCL and DoNER in Delhi explaining the present road condition and road improvement programme. The meeting was held on 11.08.2016 at 12:15 hrs under the chairmanship of Secretary (DoNER) in presence of MD, NHIDCL, and the project consultant for Orphan roads M/s S M Consultant Pvt Ltd. The presentation highlighted the physical status of the road, improvement requirement, alternate proposals on the lane width, crust, pavement type, realignment etc. which would require finalization for preparation of DPR. The scale of damage to the road was highlighted. This road falls in heavy rainfallarea. The traffic is 3 MSA and the soaked CBR was found to be averaging at 5%.

The drainage system along the road stretch is very poor which is near to non-existence of the structure. The absence of proper drainage system is a prime cause of landslides and poor road conditions.

Following decisions were made in the meeting which eventually formed the design basis for preparation of Detailed Project Report.

i. The total stretch of road is proposed to be constructed using the conventional flexible pavement procedure.
ii. Intermediate Lane Carriageway (5.5m) as per IRC guidelines with conventional bituminous pavement as per IRC 37 with GSB, WMM, DBM and BC has been provided.
iii. The open area has to be developed with 1.25 m wide paved shoulder on both sides with 5.5m carriageway and lined drain. The hill road consist of 5.5 m carriageway with 1.25m paved shoulders with breast wall on hill side and guard walls on valley side.
iv. The portion existing along the nallah, has beenproposed to have 7 m carriageway with 1.5 m paved shoulders with drain on both the side as thenallah does not cut the road and is at a distance away from the stream in some stretches. But at stretches where the nallah is just

adjacent to the road embankment and has caused damage to the road formationhas been provided with 7m carriageway and 1.5 m paved shoulder with drain on side and retaining wall at the stream side. And 5.5 m carriageway with 1.5m paved shoulder with drain in built-up area.

v. All the culverts having diameter less than 900mm has to be reconstructed with 1200mm dia NP 4 HP culverts.

vi. All the culverts having length of 10m and diameter 900mm and above has been retained if they are found to have hydraulic sufficiency and structurally adequate.

vii. All new culverts has been constructed with 12m deck/formation width.

viii. Widening to pipe culverts has been done with multiple of one pipe length of 2.5m.

ix. The horizontal geometry has been restricted to available ROW. In case of places where this design speed cannot be achieved, speed limit signs has been introduced.

x. All the three bridges has been retained.

Managing Director, NHIDCL instructed to go ahead with preparation of the DPR in line with the decisions taken in the meeting. He instructed to the Consultant to incorporate clause for five years (5 years)maintainance period including defect liability period in the bid document which will eventually be part of the contract. He advised the Consultant to submit separate DPR for Wokha-Merapani road.

## 2 PROPOSED IMPROVEMENT

**2.1 ROW:** The road has no pillars or land boundary marked on ground. However from local enquiry and physical verification it was noted that the ROW varies as follows. The development of the road shall be limited within the ROW available and no land acquisition or resettlement shall be resorted to.

**Table: RoW in Project Highway**

| Sl No | Chainage (Km) | | Existing ROW (m) | Land use |
|---|---|---|---|---|
| | From | To | | |
| 1 | 32100 | 32400 | 15 | Built-up Area |
| 2 | 39800 | 40150 | 17 | |
| 3 | 40750 | 40850 | 15 | |
| 4 | 41200 | 41350 | 15 | |
| 5 | 26000 | 32100 | 25 | Hill Area |
| 6 | 32400 | 35000 | 17 | |
| 7 | 35000 | 39800 | 22 | |
| 8 | 40150 | 40750 | 15 | |
| 9 | 40850 | 41200 | 15 | |
| 10 | 41350 | 48000 | 15 | |

**2.2. RoadCross section**: This road passes through hilly area for about 58 km and rest in plain area. The road shall be widened to have 5.5m carriageway width in built up area with paved shoulders of 1.5 m on both sides with lined drain.

Open area will have 5.5m carriageway width equivalent to intermediate lane carriageway with paved shoulder of 1.25m on both the sides with lined drain on hill side and guard wall of 0.6 m in valley side..

**TABLE:LIST OF CROSS-SECTIONS**

The existing carriageway and shoulder details are as tabulated below.

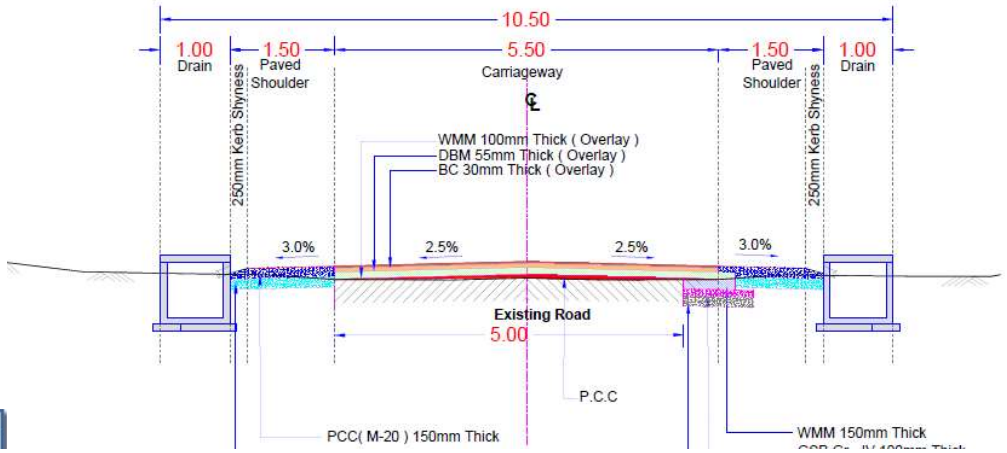
| Sl No | Chainage from | Chainage to | TYPES OF CROSS SECTIONS |
|---|---|---|---|
| 1 | 32100 | 32400 | 5.5 M CARRIAGEWAY WITH 1.5 M PAVED SHOULDERS WITH 1 M COVERED DRAIN ON TYPE 1 |
| 2 | 39800 | 40150 | |
| 3 | 40750 | 40850 | |
| 4 | 41200 | 41350 | |
| 5 | 26000 | 32100 | 5.5 M CARRIAGEWAY WITH 1.25 M CC PAVED SHOULDERS ON EITHER SIDE AND BREAST WALL ON HILL SIDE WITH 0.6M GUARD WALL ON VALLEY SIDE TYPE 3 |
| 6 | 32400 | 39800 | |
| 7 | 40150 | 40750 | |
| 8 | 40850 | 41200 | |
| 9 | 41350 | 48000 | |

**TABLE:SHOULDER DETAILS**

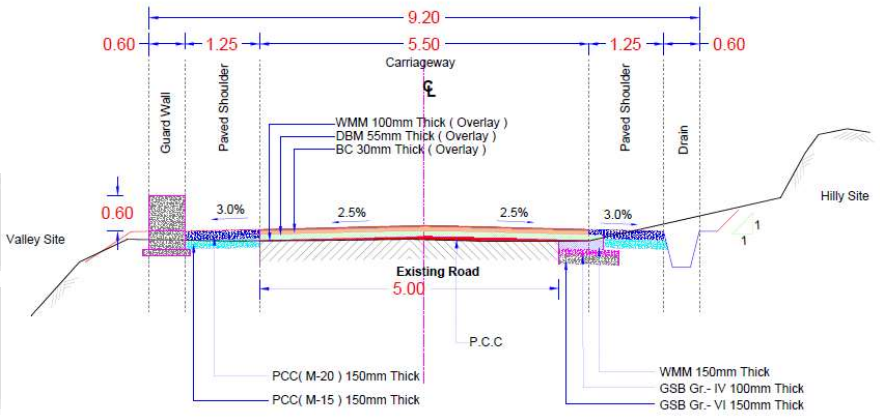
| Design Chainage (km) | | Carriageway Width | Earthen Shoulders | |
|---|---|---|---|---|
| From | To | | Left | Right |
| 26/000 | 48/000 | 5 | 1 | 1 |

The road widening and improvement proposal has been divided into 6 sections and widening& realignment of the road has been taken up as per IRC SP 73:2015 and IRC SP 48 1998.

**Section 1: Built-up Area with flexible pavement**: The road stretch passes through built-up areas requiring proper drainage facility along the stretch as the condition of the road is poor due to the improper drainage of the storm water. The stretches enumerated above have been planned for widening with 5.5 m carriageway and 1.5 m paved shoulders and provision of providing drain cum footpath on both sides.

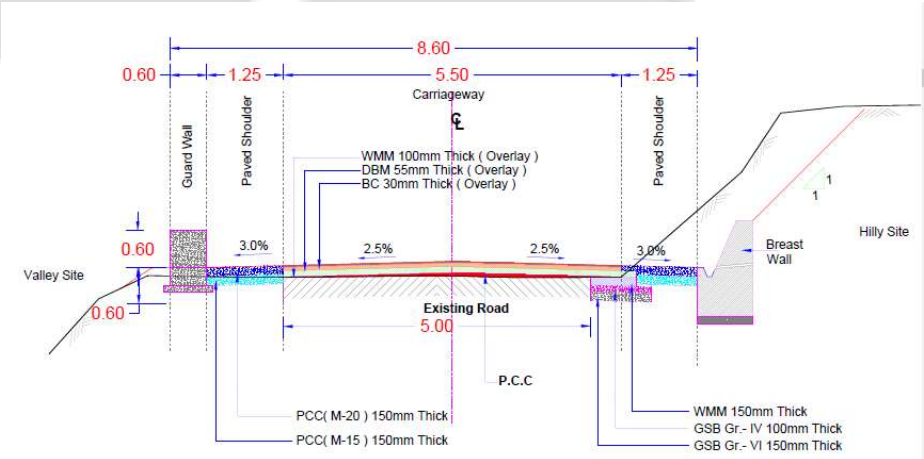


**Section 2: Open area with flexible pavement with paved shoulder**: The present condition of the road is nearly damaged at some locations. The stretch is valley on one side and small stretch of hill locks with less height are seen here. The section is provided withbituminous overlay of BC, DBM and WMM 100mm layer and lined drain on the hill side of the road.



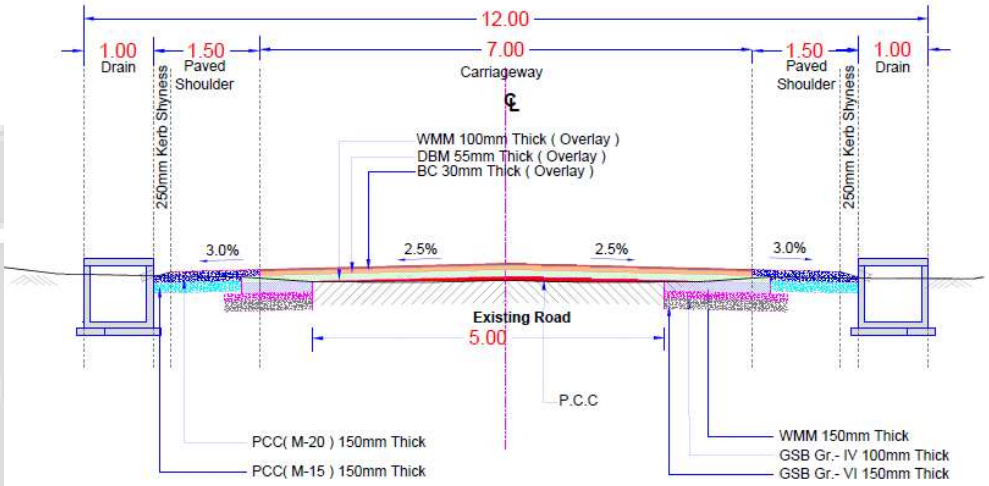

**TYPICAL CROSS SECTION ( TYPE - 2 )**

**Section 3: Open section with flexible pavement**: This stretch of area is prone to landslides as the continuous stretches of hill locks are seen in these areas. The height of hill locks increase along the road stretch. The carriageway provided is widened to 5.5 m with 1.25 m paved shoulder. The valley side along the road is protected with 0.6 m guard wall and the hill is retained by breast wall where the hill locks are adjacent to the road.The overlay provided in this stretch consists of BC, DBM and WMM 100 mm layer.



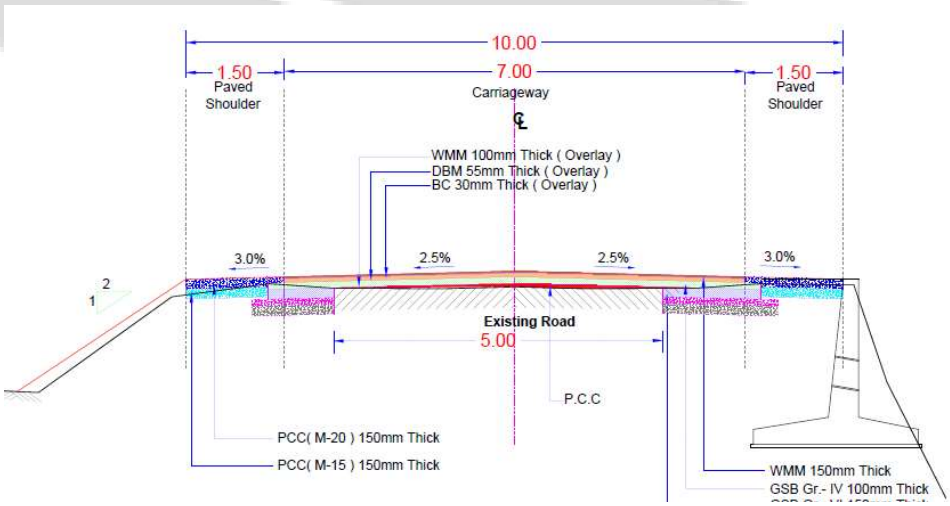

**TYPICAL CROSS SECTION ( TYPE - 3 )**

**Section 4:Open section with flexible pavement**: The road along the stretch passes near to the nallah. As the area is near the nallah, the area is under the influence of water logging. Drains of 1 m are provided along the road to avoid the effects of the water logging and avoid the damage to the pavement. Development of this stretch has been done with widening of carriageway to7 m wide and 1.5 m paved shoulder on both sides. The overlay provided in this stretch is BC, DBM and WMM (100 mm).



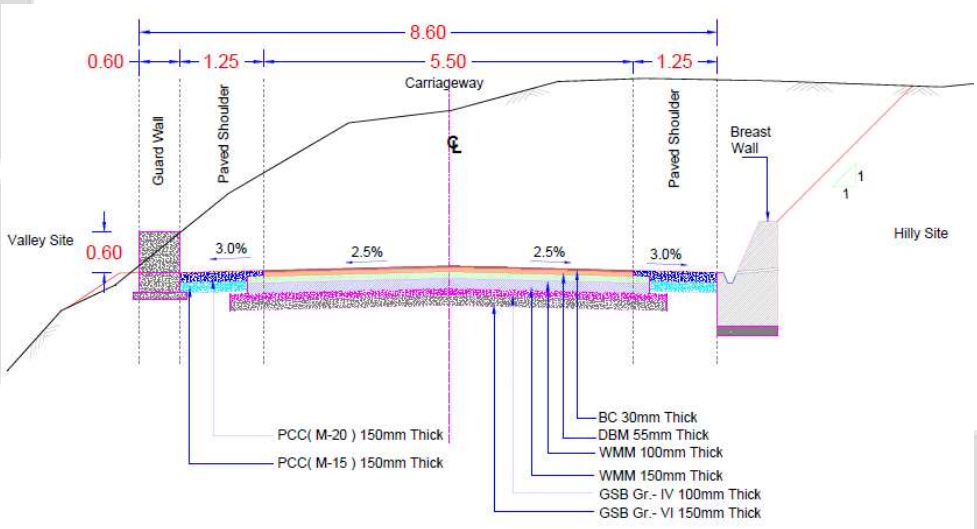

**TYPICAL CROSS SECTION ( TYPE - 4 )**

**Section 5: Open area with flexible pavement**: The present condition of the road is very poor as the subgrade of the road is totally affected by the flow of the nallah adjacent to it. The edge is totally damaged. The



carriageway of the stretch has been proposed to be widened to 7 m with paved shoulder of 1.5 m on both sides. Drain is provided on one side and to the other side retaining wall is provided to minimise the effect of the water current of the nallah which is the reason for constant degradation of the road crust.

**Section 6: Realignment Section with flexible pavement (New Alignment)**: The road in this this stretch is almost non-existent due to landslide. This stretch requires a new alignment for the road to develop. The road is proposed to be constructed by cutting the hill and providing a carriageway of 5.5 m with paved shoulders of 1.5 m and 0.6 m guard wall at the valley side and to retain the hill slope, breast wall is provided.




**TYPICAL CROSS SECTION ( TYPE - 6 )**

**2.3Longitudinal Drain**: RCC drains and lined drains are proposed to be provided near the urban areas and locations with stretches of living is found. The proposed cross-section has also provisions for proper drainage along the whole stretch by providing other drainage facility in the structures.

**2.4 Road Crust:**The existing bituminous road has been developed with flexible pavement. As the present condition of flexible road is poor, the development have been made with,100 mm WMM, DBM 55 mm and BC 30 mm as overlay and widening with 250 mm GSB with different gradation having provision for both filter and drainage layer, WMM 250 MM, DBM 50 MM and BC 40MM.

**2.5Junction development:** There is6 minor junctions which requires improvement.

**TABLE: LIST OF MINOR INTERSECTIONS**

| Sl No | Design Chainage (Km) | Side (Left/Right) | Carriageway Width in m | |
|---|---|---|---|---|
| | | | Left | Right |
| 1 | 32/232 | Left | 4.75 | |
| 2 | 32/254 | Right | | 3.3 |
| 3 | 40/738 | Left | 3.16 | |
| 4 | 41/061 | Right | | 4.35 |
| 5 | 41/100 | Right | | 1.88 |
| 6 | 41/147 | Left | 3.71 | |

## 3 STRUCTURES

The existing road alignment has 93 no of structures along the road. 90 are HP culverts, 3 number of slab culverts have been noticed along the project corridor.

The improvement proposals finalized for the stretch are:

**TABLE: LIST OFADDITIONAL STRUCTURES PROPOSED FOR THE PROJECT STRETCH**

| S. No. | Design Chainage (km) | Proposed Type of Culvert | Span Arrangement No. x Length / No. x Dia (m) |
|---|---|---|---|
| 1 | 26.200 | HP | 1 X 1.2 |
| 2 | 26.340 | HP | 1 X 1.2 |
| 3 | 27.950 | HP | 1 X 1.2 |
| 4 | 28.230 | HP | 1 X 1.2 |
| 5 | 28.650 | HP | 1 X 1.2 |
| 6 | 29.800 | HP | 1 X 1.2 |
| 7 | 30.700 | HP | 1 X 1.2 |
| 8 | 31.270 | HP | 1 X 1.2 |
| 9 | 31.460 | HP | 1 X 1.2 |
| 10 | 31.580 | HP | 1 X 1.2 |
| 11 | 31.950 | HP | 1 X 1.2 |
| 12 | 33.350 | HP | 1 X 1.2 |
| 13 | 35.680 | HP | 1 X 1.2 |
| 14 | 36.040 | HP | 1 X 1.2 |
| 15 | 36.560 | HP | 1 X 1.2 |
| 16 | 37.250 | HP | 1 X 1.2 |
| 17 | 39.090 | HP | 1 X 1.2 |
| 18 | 42.320 | HP | 1 X 1.2 |
| 19 | 42.590 | HP | 1 X 1.2 |
| 20 | 44.510 | HP | 1 X 1.2 |
| 21 | 44.650 | HP | 1 X 1.2 |
| 22 | 45.170 | HP | 1 X 1.2 |
| 23 | 45.440 | HP | 1 X 1.2 |
| 24 | 45.990 | HP | 1 X 1.2 |

| | | | |
|---|---|---|---|
| **25** | 46.700 | HP | 1 X 1.2 |
| **26** | 46.820 | HP | 1 X 1.2 |
| **27** | 47.200 | HP | 1 X 1.2 |
| **28** | 47.800 | HP | 1 X 1.2 |

Some of the existing structures need to be widened and reconstructed as the conditions of the structures is very poor. These structures are listed as below.

**TABLE: LIST OF STRUCTURES PROPOSED FOR RECONSTRUCTION**

| S. No. | Design Chainage | Proposed Type of Structure | Proposed Span (m) | Over all Width in m |
|---|---|---|---|---|
| **1** | 28.430 | HP | **1 X 1.2** | **12.5** |
| **2** | 29.155 | HP | **1 X 1.2** | **12.5** |
| **3** | 33.620 | HP | **1 X 1.2** | **12.5** |
| **4** | 34.880 | HP | **1 X 1.2** | **12.5** |
| **5** | 40.400 | HP | **1 X 1.2** | **12.5** |
| **6** | 40.970 | HP | **1 X 1.2** | **12.5** |
| **7** | 41.900 | HP | **1 X 1.2** | **12.5** |
| **8** | 43.730 | HP | **1 X 1.2** | **12.5** |
| **9** | 47.040 | HP | **1 X 1.2** | **12.5** |
| **10** | 47.730 | HP | **1 X 1.2** | **12.5** |
| **11** | 49.070 | HP | **1 X 1.2** | **12.5** |

**TABLE: LIST OF STRUCTURES PROPOSED FOR WIDENING**

| S. No. | Design Chainage | Proposed Type of Structure | Proposed Span (m) | Over all Width in m |
|---|---|---|---|---|
| **1** | 26.620 | HP | 1 X 0.9 | 5 |
| **2** | 26.710 | HP | 1 X 1.0 | 5 |
| **3** | 26.880 | HP | 1 X 0.9 | 5 |
| **4** | 27.050 | HP | 1 X 1.0 | 5 |
| **5** | 27.110 | HP | 1 X 1.0 | 5 |
| **6** | 27.230 | HP | 1 X 0.9 | 5 |
| **7** | 27.550 | SLAB | 1 X 3.3 | 5 |
| **8** | 27.840 | HP | 1 X 0.9 | 5 |
| **9** | 27.890 | HP | 1 X 0.9 | 5 |
| **10** | 28.930 | HP | 1 X 0.9 | 5 |
| **11** | 29.390 | HP | 1 X 0.9 | 5 |
| **12** | 29.460 | HP | 1 X 0.9 | 5 |
| **13** | 30.140 | HP | 1 X 1.0 | 5 |
| **14** | 30.190 | HP | 1 X 0.9 | 5 |
| **15** | 30.400 | HP | 1 X 1.0 | 5 |

| | | | | |
|---|---|---|---|---|
| **16** | 30.870 | HP | 1 X 1.0 | 5 |
| **17** | 30.950 | HP | 1 X 0.9 | 5 |
| **18** | 31.140 | HP | 1 X 0.9 | 5 |
| **19** | 31.700 | HP | 1 X 0.9 | 5 |
| **20** | 31.800 | HP | 1 X 0.9 | 5 |
| **21** | 32.590 | HP | 1 X 1.0 | 5 |
| **22** | 32.710 | HP | 1 X 0.9 | 5 |
| **23** | 32.860 | HP | 1 X 1.0 | 5 |
| **24** | 32.910 | HP | 1 X 1.0 | 5 |
| **25** | 33.090 | HP | 1 X 0.9 | 5 |
| **26** | 33.250 | HP | 1 X 1.0 | 5 |
| **27** | 33.400 | HP | 1 X 1.0 | 5 |
| **28** | 33.715 | HP | 1 X 0.9 | 5 |
| **29** | 33.770 | HP | 1 X 0.9 | 5 |
| **30** | 33.870 | HP | 1 X 0.9 | 5 |
| **31** | 33.955 | HP | 1 X 0.9 | 5 |
| **32** | 34.080 | HP | 1 X 0.9 | 5 |
| **33** | 34.110 | HP | 1 X 1.0 | 5 |
| **34** | 34.290 | HP | 1 X 0.9 | 5 |
| **35** | 34.470 | HP | 1 X 0.9 | 5 |
| **36** | 34.620 | HP | 1 X 1.0 | 5 |
| **37** | 34.700 | HP | 1 X 0.9 | 5 |
| **38** | 34.750 | HP | 1 X 0.9 | 5 |
| **39** | 34.940 | HP | 1 X 0.9 | 5 |
| **40** | 34.960 | HP | 1 X 0.9 | 5 |
| **41** | 35.380 | HP | 1 X 1.0 | 5 |
| **42** | 35.890 | HP | 1 X 1.0 | 5 |
| **43** | 36.310 | HP | 1 X 0.9 | 5 |
| **44** | 36.400 | HP | 1 X 0.9 | 5 |
| **45** | 36.710 | HP | 1 X 0.9 | 5 |
| **46** | 36.900 | HP | 1 X 0.9 | 5 |
| **47** | 36.980 | HP | 1 X 0.9 | 5 |
| **48** | 37.480 | SLAB | 1 X 3.0 | 5 |
| **49** | 37.740 | HP | 1 X 1.0 | 5 |
| **50** | 37.975 | SLAB | 1 X 5.8 | 5 |
| **51** | 38.220 | HP | 1 X 0.9 | 5 |

| | | | | |
|---|---|---|---|---|
| **52** | 38.320 | HP | 1 X 0.9 | 5 |
| **53** | 38.470 | HP | 1 X 0.9 | 5 |
| **54** | 38.690 | HP | 1 X 0.9 | 5 |
| **55** | 39.000 | HP | 1 X 1.0 | 5 |
| **56** | 39.500 | HP | 1 X 0.9 | 5 |
| **57** | 39.600 | HP | 1 X 0.9 | 2.5 |
| **58** | 39.980 | HP | 1 X 0.9 | 5 |
| **59** | 40.130 | HP | 1 X 0.9 | 2.5 |
| **60** | 40.230 | HP | 1 X 0.9 | 5 |
| **61** | 40.820 | HP | 1 X 0.9 | 2.5 |
| **62** | 41.250 | HP | 1 X 1.0 | 5 |
| **63** | 41.290 | HP | 1 X 0.9 | 2.5 |
| **64** | 41.480 | HP | 1 X 1.0 | 5 |
| **65** | 41.700 | HP | 1 X 0.9 | 5 |
| **66** | 42.030 | HP | 1 X 0.9 | 2.5 |
| **67** | 43.015 | HP | 1 X 0.9 | 2.5 |
| **68** | 43.130 | HP | 1 X 0.9 | 5 |
| **69** | 43.520 | HP | 1 X 0.9 | 5 |
| **70** | 43.660 | HP | 1 X 0.9 | 5 |
| **71** | 43.760 | HP | 1 X 0.9 | 5 |
| **72** | 43.850 | HP | 1 X 0.9 | 5 |
| **73** | 43.900 | HP | 1 X 0.9 | 5 |
| **74** | 45.880 | HP | 1 X 0.9 | 5 |

Some of the structures are in good condition but require some repairing work to improve their performance and protection level. These are as listed below:

**TABLE: STUCTURES REQUIRING REPAIRS/ REPLACEMENTS OF RAILING /PARAPETS, FLOORING AND PROTECTION WORKS**

| Sl. No. | Design Chainage | Type of Structures | Repair work | Length (m) | Width (m) |
|---|---|---|---|---|---|
| 1 | 32.800 | HP | Crash barrier | Replacement of parapet wall with concrete crash barrier using minimum grade of concrete M40, Floor protection and other features requiring repair should be done as per site requirement and in consultation with A.E. | |
| | | | PCC M15 in Leveling Course | | |
| | | | PCC M20 in Catch pit | | |
| | | | Floor Apron | | |
| 2 | 33.180 | HP | Crash barrier | | |

| | | | |
|---|---|---|---|
| | | | PCC M15 in Leveling Course |
| | | | PCC M20 in Catch pit |
| | | | Floor Apron |
| 3 | 36.760 | HP | Crash barrier |
| | | | PCC M15 in Leveling Course |
| | | | PCC M20 in Catch pit |
| | | | Floor Apron |
| 4 | 38.910 | HP | Crash barrier |
| | | | PCC M15 in Leveling Course |
| | | | PCC M20 in Catch pit |
| | | | Floor Apron |
| 5 | 45.620 | HP | Crash barrier |
| | | | PCC M15 in Leveling Course |
| | | | PCC M20 in Catch pit |
| | | | Floor Apron |

The existing road has been provided with the following protection works on the road stretch.

Construction of guard wall, retaining wall and breast wall has to be provided at the below mentioned chainage.

**TABLE: LIST OF PROTECTION WORKS**

**1. GUARD WALL**

| Sl no | Chainage from - to | | Height | Side |
|---|---|---|---|---|
| 1 | 26/000 | 32/100 | 0.6 m | On Valley Side |
| 2 | 32/400 | 39/800 | | |
| 3 | 40/150 | 40/750 | | |
| 4 | 40/850 | 41/200 | | |
| 5 | 41/350 | 48/000 | | |

**2. RETAINING WALL**

| Sl no | Chainage from to to | | Height | Side |
|---|---|---|---|---|
| | | | | |

### 3. BREAST WALL

| Sl no | Chainage (km) | Length (m) | Location and Height | Side |
|---|---|---|---|---|
| 1 | 32/400-33/500 | 1100 | To be finalized in consultation with A.E. | Hilly side |
| 2 | 38/00-38/200 | 200 | | Hilly side |
| 3 | 38/500-38/900 | 400 | | Hilly side |
| 4 | 41/800-41/900 | 100 | | Hilly side |
| 5 | 43/500-43/900 | 400 | | Hilly side |

## 4 COST ESTIMATE

The project cost is worked out according to the improvement proposals enumerated in chapter 8. The summary of the cost is as provided below.

### TABLE: SUMMARY OF COST ESTIMATES

**GENERAL ABSTRACT**

**Name of Work:-Consultancy Services for Preparation of Detailed Project Report for Four Different Roads in the North Eastern State (Wokha to Merapani)**

| SL. NO | TYPE OF WORK | AMOUNT | REMARKS |
|---|---|---|---|
| | | | |
| 1 | Road Work | 348671307.88 | |
| | | | |
| 2 | C.D Works | | |
| i) | Hume Pipe Culvert | 19488199.73 | |
| ii) | Repair of Culverts | 14706306.94 | |
| 3 | Miscellaneous Item | | |
| i) | Drain | 12055910.80 | |
| ii) | Breast Wall | 82239051.44 | |
| iii) | Guard Wall | 43842575.34 | |
| iv) | Junctions | 1621357.43 | |
| v) | Signs & Safety | 4220780.77 | |
| vi) | Project falities (Crash Barriers) | 479369.46 | |
| | Sub Total | 527324859.79 | |
| | | | |

| | | | |
|---|---|---|---|
| | Add Price escalation for years 2014-15, 2015-16 & 2016-17 (5% per annum) i.e. 15% | 79098728.97 | |
| | | | |
| 4 | Total Civil Cost "A" (Rs.) | 606423588.75 | A |
| | Add Contingency @ 2.8% on"A" | 16979860.49 | B |
| 5 | Total Cost with contingency (EPC Cost = A+B) | 623403449.24 | C |
| | Add Agency Charges @ 3.0% on "C" | 18702103.48 | D |
| | Add Quality Control @ 0.5% on "C" | 3117017.25 | E |
| | Add Road Safety @ 0.5% on "C" | 3117017.25 | F |
| | Add Supervision @ 4.0% on "C" | 24936137.97 | G |
| | Add Escalation @ 10.0% on "A" (5% per year) | | H |
| | Add Maintenance @ 5.0% on "A" | | |
| | 1st year (0.5%) | 3032117.94 | I |
| | 2nd year (0.5%) | 3032117.94 | |
| | 3rd year(1.0%) | 6064235.89 | |
| | 4th year (1.5%) | 9096353.83 | |
| | 5th year (1.5%) | 9096353.83 | |
| | Sum(C+D+E+F+G+H+I) | 703596904.61 | J |
| | Add for Preconstruction activities | 500000.00 | K |
| | Add for Tree cutting & avenue Plantation | 1500000.00 | L |
| | | | |
| | GRAND TOTAL (J+K+L) | 705596904.61 | |
| | | | |
| | SAY Rs. | 70.56 | |
| | | CRORES | |

## 5 CONSTRUCTION SCHEDULING

The time period of implementation for such a road is 6 months. Therefore, any delay in handing over of the site will delay the project implementation.

## 6 CONCLUSION

The technology adopted for improvement of this road is the conventional flexible pavement method. The methods of improvement aims the overall pavement development in the area and provide an easy communication within the area and also within the state.